

The Application of Emerging Technologies to Virus Detection in Water

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Human enteric viruses belonging to many different viral genera cause waterborne disease when susceptible individuals are exposed to contaminated drinking and recreational waters. Diseases resulting from infection with these viruses include gastroenteritis, hepatitis, encephalitis, meningitis, myocarditis, temporary paralysis and possibly diabetes. Symptoms are often mild, but can be severe in sensitive target groups, such as the very young and elderly.

It is important that methods based upon emerging technologies are able to detect many of the viral groups that cause waterborne disease. Specific virus methods, based upon the polymerase chain reaction (PCR), have been developed by the National Exposure Research Laboratory (NERL). While PCR methods are rapid and can detect all the virus groups known to cause waterborne disease, the methods have several unique problems that require a much higher level of quality assurance than that used in traditional microbiology or chemistry laboratories. A quality assurance guide for using PCR methods in support of EPA's mission is being developed through a collaborative partnership of NERL and the Technical Support Center (TSC) of the Office of Ground Water and Drinking Water. This QA guide is a key outcome of a recent, jointly sponsored workshop on PCR methods.

NERL's PCR methods were originally developed as part of a national groundwater survey that was conducted through the partnering of NERL, TSC and the American Water Works Association Research Foundation. In order to determine whether the methods would detect viruses in surface waters and test the level of quality assurance that had been developed, further collaboration was sought with another partner, the U.S. Geological Survey. The studies on ground and surface waters demonstrated that the methods could be used on a majority of water types covering most of the conditions typically found in the U.S. Methods were further tested in collaborative studies to determine the cause of two independent waterborne outbreaks of gastroenteritis in Wyoming during 2001. These studies involved personnel from Wyoming, the Centers for Disease Control, EPA's Region VIII and the University of North Carolina. In both cases NERL's methods successfully identified the agent in water that was responsible for the outbreak. NERL's collaborative efforts to develop and evaluate emerging virus detection methodology have clearly demonstrated the usefulness of the partnering process.

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